GRACE HATCHERY
ANNUAL REPORT

INTRODUCTION

Grace Hatchery was constructed in 1946, and is located in southeast Idaho in Caribou County, eight miles south of the small town of Grace. The hatchery water supply consists of several springs that form the small creek known as Whiskey Creek. Water temperature remains constant at 52°F year-round. Water flows vary from year to year, depending on snowpack and irrigation demands by local farmers. The hatchery is currently experiencing drought conditions, and fish production has been impacted.

Grace Hatchery stocked a total of 665,000 fish (131,000 lbs) during the past year. Of these, 271,000 were 9-inch plus rainbow trout, 92,000 were 6-inch plus rainbow, and 302,000 were 6- to 7-inch Bear Lake cutthroat (Table 1).

Two Bear Lake cutthroat traps were operated during the year. One was in place on the Little Blackfoot River (a tributary of Blackfoot Reservoir), and the other was installed on St. Charles Creek (an Idaho tributary to Bear Lake).

HATCHERY IMPROVEMENTS

Most of the buildings on the hatchery received a new paint job and color scheme; light brown with dark brown trim. The old shingle roof was removed from the hatchery building and a new brown metal roof was installed in its place. An old freezer room was remodeled and converted into a paint and chemical storage room. Also, an egg reception room was created at the back of the hatchery building, where it is located closer to the incubation facilities. A cofferdam was built in the main spring pond to insure adequate water to the hatchery building and small raceway system during low water years. Jump barrier screens were built for the small raceways to keep fish from jumping out at the water inflows. Numerous modifications were made to the hatchery's fish pump/dewatering tower and feeding trailer to better facilitate routine operations.

The major equipment purchase for the year was a new 1,500-gallon fish transport tank for the hatchery 2-ton truck. This will greatly increase the fish hauling capability of Grace Hatchery. The office received a micro-computer with hard drive and a new color monitor. Residences 1 and 2 received new wood burning stoves. Residence 1 also received a new electric oven as an emergency purchase when the old original built-in oven unexpectedly burned out.

The Bureau of Engineering's construction crew came down in the fall to begin construction of a fish trap on the Blackfoot River. While they were in the area, they also poured the floor for a new garage for Residence 3, replaced the leaking domestic water line to Residence 1, and dug a new fish mortality disposal pit for the hatchery.

Table 1. Fish requested and stocked.

Species	Size	Production goal	Actual production	Percentage of goal achieved
Rainbow (R8)	9 in. +	250,000	271,149	108%
Rainbow (R1)	6-7 in.	250,000	92,144[a]	37%[a]
Cutthroat (C5)	6-7 in.	300,000	302,358	101%

[a]As of September 30, 1989. By the end of October, a total of 245,447 6- to 7-inch rainbow were planted = 98% of goal achieved.

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PUBLIC RELATIONS

During the past year, hatchery visitation was estimated at approximately 5,000 people. This figure includes organized tours, such as cub scout troops, elementary school classes, and similar youth organizations, as well as regular visitors. Free Fishing **Day** was again popular with the area youth: 227 children took 423 fish from the hatchery settling pond; the two largest being an 8-lb 4-oz rainbow and **a** 5-lb 4-oz brown trout.

During the month of February, the hatchery staff planted Chesterfield Reservoir with 9,000 catchable rainbow in three separate plantings of 3,000 fish each. This was done to reestablish the trout population following treatment in the fall. Several Region 5 personnel assisted with the plants, including: Dan Schill (Regional Fisheries Biologist), Larry LaBolle (Regional Fisheries Manager), Phil Cooper (Regional Wildlife Conservation Educator), Wes Cannon (Conservation Officer; Grace), Chris Bocek (Conservation Officer Trainee; Pocatello), and Dave Koehler (Conservation Officer; Pocatello). Coverage of the plants was provided by the Idaho State Journal and the Caribou County Sun, with front page articles explaining about the fall treatments and subsequent low water which made fall planting impossible.

Hatchery personnel aided in the October treatment of Treasureton Reservoir, standing by with the live-haul truck in case any game fish were found. Two largemouth bass were rescued and placed in Condie Reservoir.

FISH HEALTH

In early March through late May, the resident fishery pathologist visited the hatchery and took samples of all the fish on station, as well as the wild brood fish being spawned at Little Blackfoot and Swan Creek, Utah. One brood lot (log #89-90) tested positive for bacterial kidney disease Renibacterium salmoninarum in the ovarian fluid (Table 2). The fingerlings from this brood lot, and all other lots exposed to them, were destroyed to prevent any possible spread of the disease.

Aeromomnas hvdrophila and secondary Myxobacteria (coldwater disease) was encountered in late July and August in the Tensleep strain of rainbows. The outbreak occurred in a period of low water flows and subsequent crowding. Initial treatments were 1-hour drip treatments of Cutrine, followed by 1-2 ppm of Benzalkonium Chloride for a three-day period. Following positive identification of the bacterium, the treatment regime was changed to feeding Terramycin at a level of 3.3 grams per 100 lbs for 14 days and a 2% salt bath for 15 minutes (Table 2). No significant change in mortality was noted until water flows were restored.

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Table 2. Fish Health Report, October 1, 1988 to September 30, 1989.

Brood year	Stock	Species	Log #	Date	VH	VP	VE	BK	BR	BF	PW	PF	PC	Comments
1988	Little Blackfoot	Ct	89-27	3/10	--	--	--	--	--	--	--	xx	--	
1988	Egan Tensleep	Rbt	89-37	3/8	-	--	xx	xx	xx	xx	xx	xx	xx	
1988	Bear Lake	Ct	89-38	3/8	--	--	--	--	--	--	--	xx	xx	
Wild	Little Blackfoot	Ct	89-86	5/30	--	--	--	--	--	-	xx	xx	xx	VEN-like = 9/10
Brood	Little Blackfoot	Ct	89-90	5/31	--	--	xx	++	xx	xx	--	xx	xx	
Brood	Little Blackfoot	Ct	89-99	5/31	--	--	xx	--	xx	xx	xx	xx	xx	
Wild	Settling Pond	Rbt	89-109	6/28	xx	xx	xx	xx	xx	xx	--	xx	xx	Settling pond fish
Brood	Swan Creek	Ct	89-110	6/28	xx	xx	xx	--	xx	xx	xx	xx	xx	ELISA & FAT 0/29
1989	Little Blackfoot	Ct	89-111	6/28	xx	xx	xx	--	xx	xx	xx	xx	xx	ELISA = 0/4 FAT = 0/80
1989	Tensleep	Rbt	89-147	8/25	xx	xx	xx	xx	--	--	xx	xx	xx	A-hydrophila treated w/TM100
1989	Egan	Rbt	eggs tested negative by Utah Division of Natural Resourses prior to shipment.											

- = negative results
x = testing/sampling not feasible
+ = positive results

VH - IHN
VP - IPNV
VE - EIBS
BK - bacterial kidney disease
BF - bacterial furunculosis
PW - whirling disease agent
•PK - proliferative kidney disease
PC - Ceratovmxa shasta

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FISH PRODUCTION

Most of the fish at Grace Hatchery are produced from eyed eggs received from the State of Utah, Division of Natural Resources, Egan Hatchery, located in Bicknell, Utah (Table 3). In addition, green Bear Lake cutthroat eggs are obtained from the spawntaking operation on the Little Blackfoot River.

This was the third year Grace Hatchery has experienced lower than normal winter snowpack. The hatchery spring flow is replenished on a two-year cycle. The low water flows experienced this year was a direct result of the mild winter of 1986-87. Based on total flow records from 1983 to 1987 (normal years), FY-89 flows have averaged 67.5% of normal (Figure 1). This closely corresponds to the 70% snowpack level recorded for this area by the Idaho Department of Water Resources for the winter of 1986-87. The subsequent winters of 1987-88 and 1988-89 were also mild. Future water flows are expected to continue to be below normal and possibly will affect the future rearing capacity of this station.

With this in mind, rainbow catchable production for FY-89 was cut by 20%. The low water situation and a change in regional programs resulted in a major program shift to fall fingerling to make up for some of the lost catchable production. Next year, the hatchery will shift even more catchable production to fall fingerling production. Goals for next year are 200,000 catchables and 500,000 6-inch plus fall fingerling.

Hatchery personnel have re-evaluated feed projection constants based on the lot history and ponding records of the past three years. These constants have been refined to coincide with each species and the different ponds they are reared in (Table 4). This refinement should result in better hatchery efficiency and increased fish growth. In turn, this should maximize the use of this facility and its **available** water.

Strain evaluations should become an integral part of this refinement process. Shepherd of the Hills is the strain of rainbow predominantly being reared at this station, but other strains are also raised. If possible, these strains should be carefully evaluated on a side-by-side experimental production basis. Bear Lake cutthroat, although the same strain, can come from different spawntaking sources. These too should be evaluated on a side-by-side basis. All of this is now possible with the reduction in catchable numbers.

With the anticipated low water flows in the future, hatchery carrying capacities will have to be carefully monitored. Rearing programs may need to be periodically readjusted to compensate for loss of production potential due to the water shortage.

In fish year 1989, the fish were fed a total of 168,430 lbs of feed at a cost of $48,568.18. This year, the rainbow received 135,200 lbs of dry feed and 650 lbs of semi-moist feed. They had an overall feed conversion of 1.39:1 and feed costs were $.36/lb. Bear Lake cutthroat were fed 19,600 lbs of semi-moist feed and 13,000 lbs of dry feed. They had an overall feed conversion of 1.07:1 and a feed cost of $.45/lb of fish produced. The overall hatchery feed

Table 3. Fish production at Grace Hatchery, October 1, 1988 to September 30, 1989.

Species & strain	Date Received	Received as (or carried	Source	Number	Percen hatch	Destination/ date & size	Yield	Percent survival
Rainbow (R8) Shep. of Hills	12/6/88	eyed eggs	Egan SFH, UT	348,500	95%	Statewide 8/89-9/90 6-9"+	269,000	81% expected
Rainbow Ten Sleep	1/17/89	eyed eggs	Egan SFH, UT	262,400	95%	Statewide 10/89-9/90 6-[illegible]"	140,000	56% expected[c]
Rainbow (R8) Shep. of Hills	12/15/87	[a]	Egan SFH, UT	170,611	N/A	Statewide 2-8/89 9"+	148,416	87% survival actual from 10/1/88
Rainbow (R8) Shep. of Hills	1/28/88	[a]	Egan SFH, UT	170,623	N/A	Statewide 10/88-11/89 6-9"+	158,868	93% survival actual from 10/1/88
Cutthroat (C5) Bear Lake	5/11/89-6/11/89	green eggs	Blackfoot Res.	489,416	63%	Blackfoot Res. 3-5/90 6"+	150,000	31% expected[b]
Cutthroat (C5) Bear Lake	5/88-	a	Blackfoot Res., Egan SFH, & White rocks SFH, UT	327,421	N/A	Blackfoot Res. 3-6/89 6"+	302,358	92% survival actual from 10/1/88

[a] See FY 88 report.
[b] 90,000 destroyed-suspected BKD carriers.
[c] 38% loss in first 4 months of rearing (see Table 2, Fish Health Report).

FIGURE 1. GRACE HATCHERY WATER FLOWS

(MONTHLY AVERAGES)

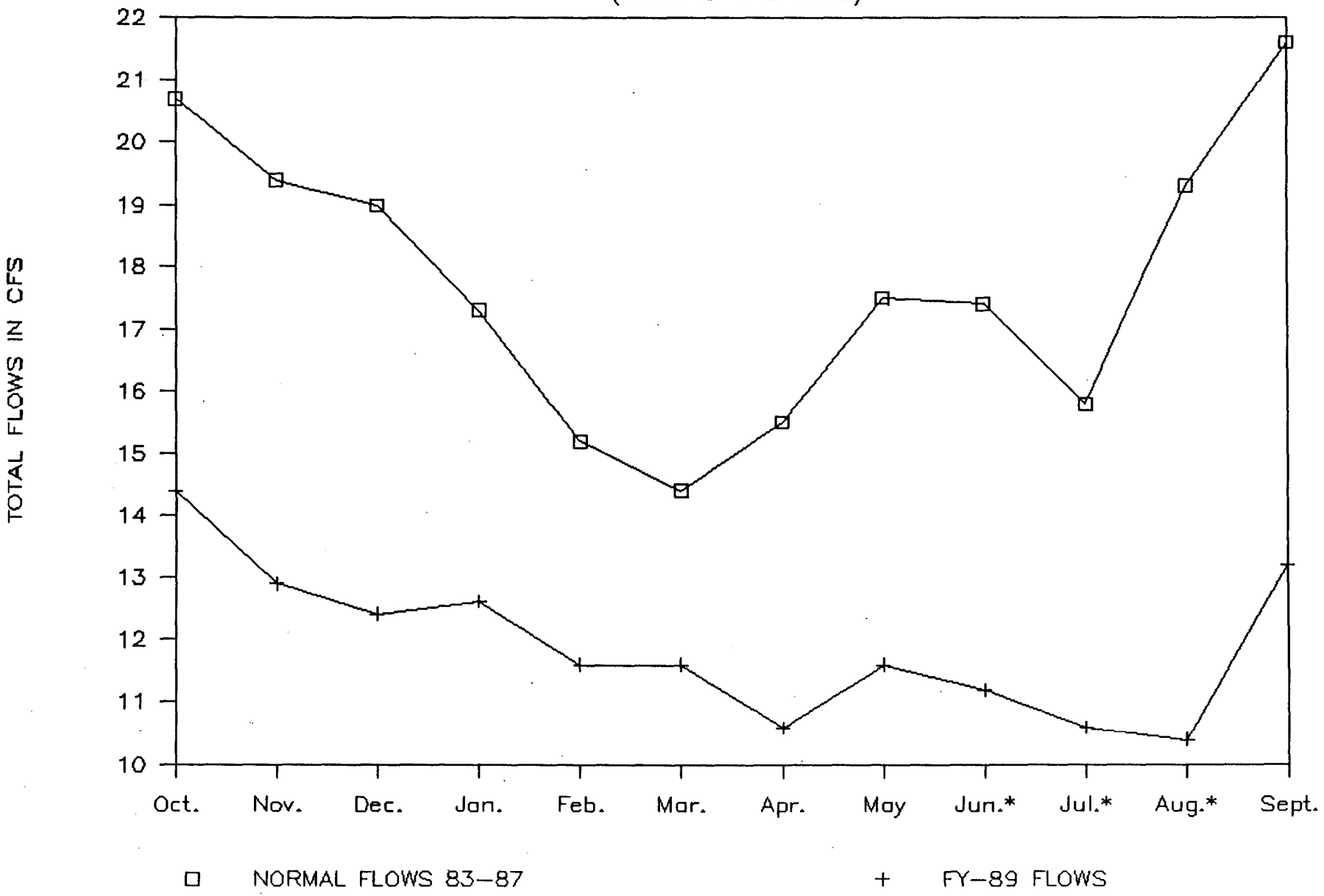

Table 4. Refined production figures (based on FY-86 to FY-89 lot history and ponding records).

Species	Pond	Size of fish	Rearing period	Projected feed conversion	Daily change of length	Maximum density index	Maximum flow index
Rainbow	vats	0-2.5"	3 months	1.2	.024"	.75	1.5
Rainbow	med rcwys	2.5-5"	3 months	1.2	.024"	.60	1.5
Rainbow	grade to lg.	5"	3 months	1.2	.025"	.60	1.5
Rainbow	large rcwys	5-10"	6 months	1.2	.021"	.35	1.5[a]
Cutthroat	vats	0-3"	4 months	1.2	.019"	.60	1.5
Cutthroat	sm rcwys	3-6"+	5 months	1.2	.022	.60	1.5

[a]Maximum flow index for two 100-foot sections.

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conversion was 1.31:1, and the total cost per pound was $1.17. On an average, each fish raised at the Grace Hatchery this year cost the department $.04 to feed and a total of $.12 to rear. For a species and lot breakdown, see Table 5.

SPECIAL PROJECTS

St. Charles Creek Trapping

Grace Hatchery annually operates a temporary trap on St.Charles Creek, an Idaho tributary of Bear Lake, to capture brood Bear Lake cutthroat trout. The purpose of this activity is to maintain a wild egg source of this unique stock of fish. Eighty percent of all captured cutthroat adults are transferred to the Utah Department of Natural Resources' facility at Swan Creek for artificial spawning, and 20% are released over the St. Charles Creek weir to reproduce naturally. Eggs spawned at Swan Creek are taken to the Mantua Hatchery (Utah) for incubation, and are then transferred to Midway Hatchery (Utah) or to Grace Hatchery for rearing. Fingerling (5.5 to 7.0 inches) are released the following Spring (May-June).

The trap was installed on April 10, 1989, at a new site approximately 100 ft below the county road. This site was chosen to shorten the distance from the mouth of the creek and to avoid access difficulties at the old site. Morpholine was not used to attract returning cutthroat this year. Low lake level placed the mouth of the creek several hundred yards below the last riparian cover, so ten plywood shades were constructed and placed over the creek. Fish were observed using these for shade from the sun and protection from predatory birds. The trap operated until June 16 (67 days), when it was discovered that an error in regulations was about to open the mouth of St. Charles Creek to fishing. Numbers of fish in the trap were starting to decline (Table 6), indicating that the run was nearly over. The trap was therefore removed to avoid conflict with anglers.

A problem occurred on May 9, when the entire flow of St. Charles Creek was diverted to irrigate pasture land above the trap. No fish were lost to dewatering, but runoff debris from the pasture plugged the weir, nearly causing the trap to wash out and allowing an undetermined number of cutthroat to jump the weir and migrate upstream.

A total of 302 Bear Lake cutthroat spawners were captured, including 126 males and 176 females (42% and 58%, respectively). Sixty-one fish (32 males and 29 females) were tagged and released upstream. Two hundred and forty-one cutthroat were transferred to Swan Creek (104 males, 137 females). Length frequency data for males and females are presented in Figures 2 and 3. Mean lengths for both sexes were down from 1988, decreasing by 2.7 mm in the females (0.5%) and by 16.3 mm (2.9%) in the males.

Spawning operations at Swan Creek resulted in 1,042,710 green cutthroat eggs, the most taken since 1978. Fish from St. Charles Creek contributed 377,221

Table 5. Cost of fish production at Grace Hatchery, October 1, 1988 to September 30, 1989.

Species & strain	No./lbs planted (or on station*)	Siz	Management plan	Destination	Percent of budget	Total cost	Cost/ fish	Cost/ pound
Rainbow (Rl) (mixed strains)	271,149/91,549	9"+	Put-and-take	Statewide	35%	$52,500.00	$.19	$0.57
Rainbow (R1) (mixed strains)	92,144/8,515	6"+	Put-grow-and-take	Region 5	4%	6,000.00	.07	0.70
Cutthroat (C5) Bear Lake	302,358/31,840	6"+	Species Establishment	Blackfoot Res.	26%	39,000.00	.13	1.22
Rainbow (R8) Shep. of Hills	13,835/5,315[a]	9"+	Put-and-take (89)	Region 5	2%	3,000.00	.22	0.56
Rainbow (R8) Shep. of Hills	268,223/32,316[a]	6"+	Put-and-take (90) Put-grow-and-take (89)	Region 5 Blackfoot Res.	21%	31,500.00	.06	0.97
Rainbow (RT) Ten Sleep	132,026/12,455[a]	6"+	Put-and-take (90) Put-grow-and-take (89)	Region 5 Blackfoot Res.	8%	12,000.00	.09	0.96
Cutthroat (C5) Bear Lake	158,572/814	0-3"	Species Establishment	Blackfoot Res.	4%	6,000.00	.04	7.37[c]

[a] Fish still on station.
[b] Total costs are based on a percentage of the FY 89 operations budget.
[c] 90,000 fish/180 lbs destroyed on 8/15/89-suspected BKD carriers.

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Table 6. Summary of trap operations on St. Charles Creek, April 10 through June 16, 1989.

Week	No. of cutthroat	Male/ female	Water temp. range (F)	Other fish
4/10-16	2	1/1	33-54	29 carp
4/17-23	4	1/3	38-54	11 sucker 20 carp
4/24-30	6	4/2	32-54	2 sucker
5/1-7	36	27/9	45-60	8 sucker 72 carp 28 sucker
5/8-14	60	22/38	34-58	1 rbt 58 carp 54 sucker 1 rbt
5/15-21	44	23/21		1 C5*
			34-68	21 carp 20 sucker 4 rbt
5/22-28	48	20/28		2 C5*
			41-76	48 carp 61 sucker 1 rbt
5/29-6/4	50	17/33		3 C5*
			45-68	56 carp 44sucker
6/5-11	37	10/27		6C5*
			45-68	23carp 144sucker
6/12-16	15	1/14		4C5*
			45-70	39carp 140 sucker 3 C5*
	302	126/176	X=48.5	36 carp 6 512 sucker 7 rbt 19 C5*

*Repeat return cutthroat in 1989, after being spawned, marked, and released at Swan Creek. All were released above the weir.

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FIGURE 2. ST.CHARLES CREEK TRAP--1989

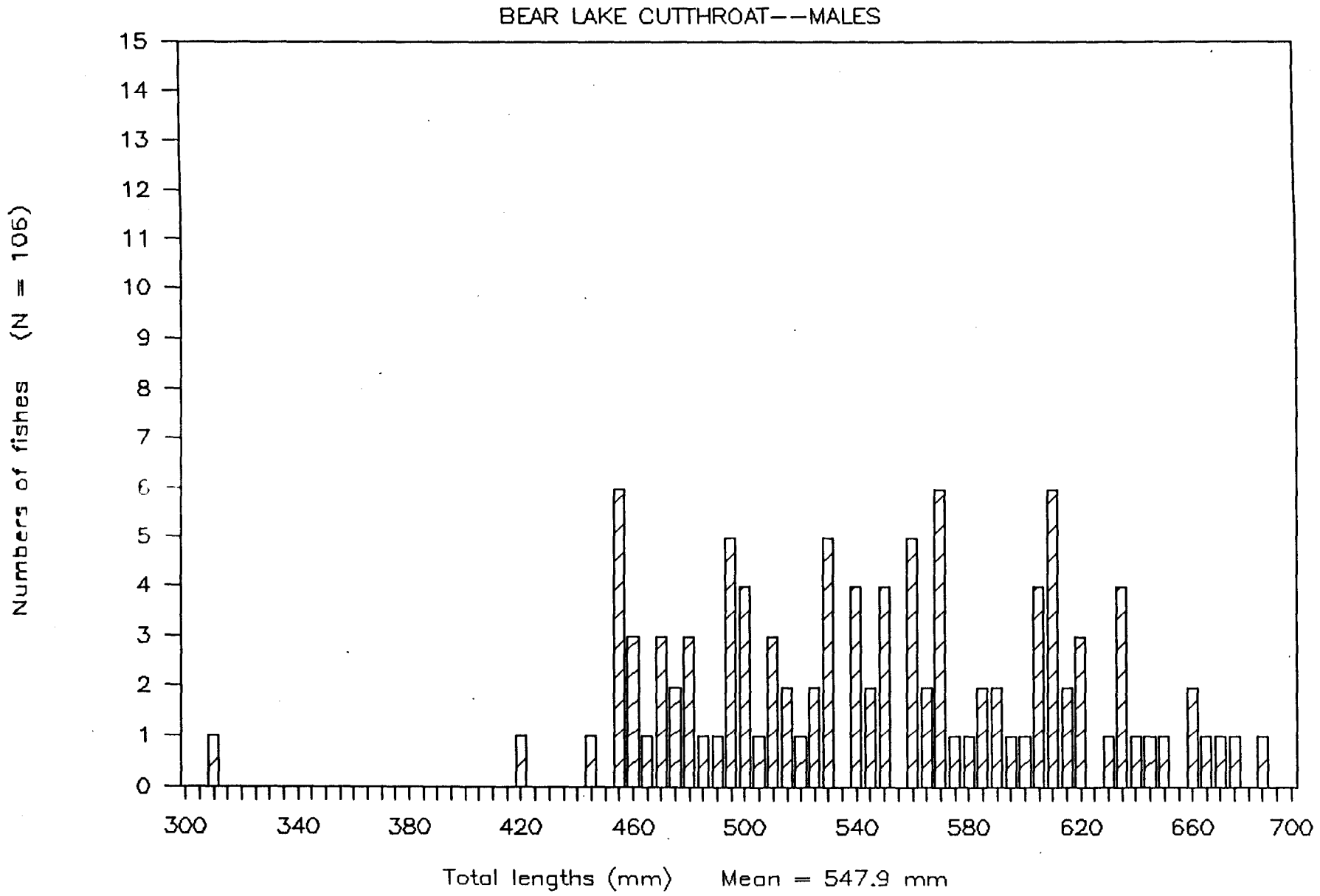
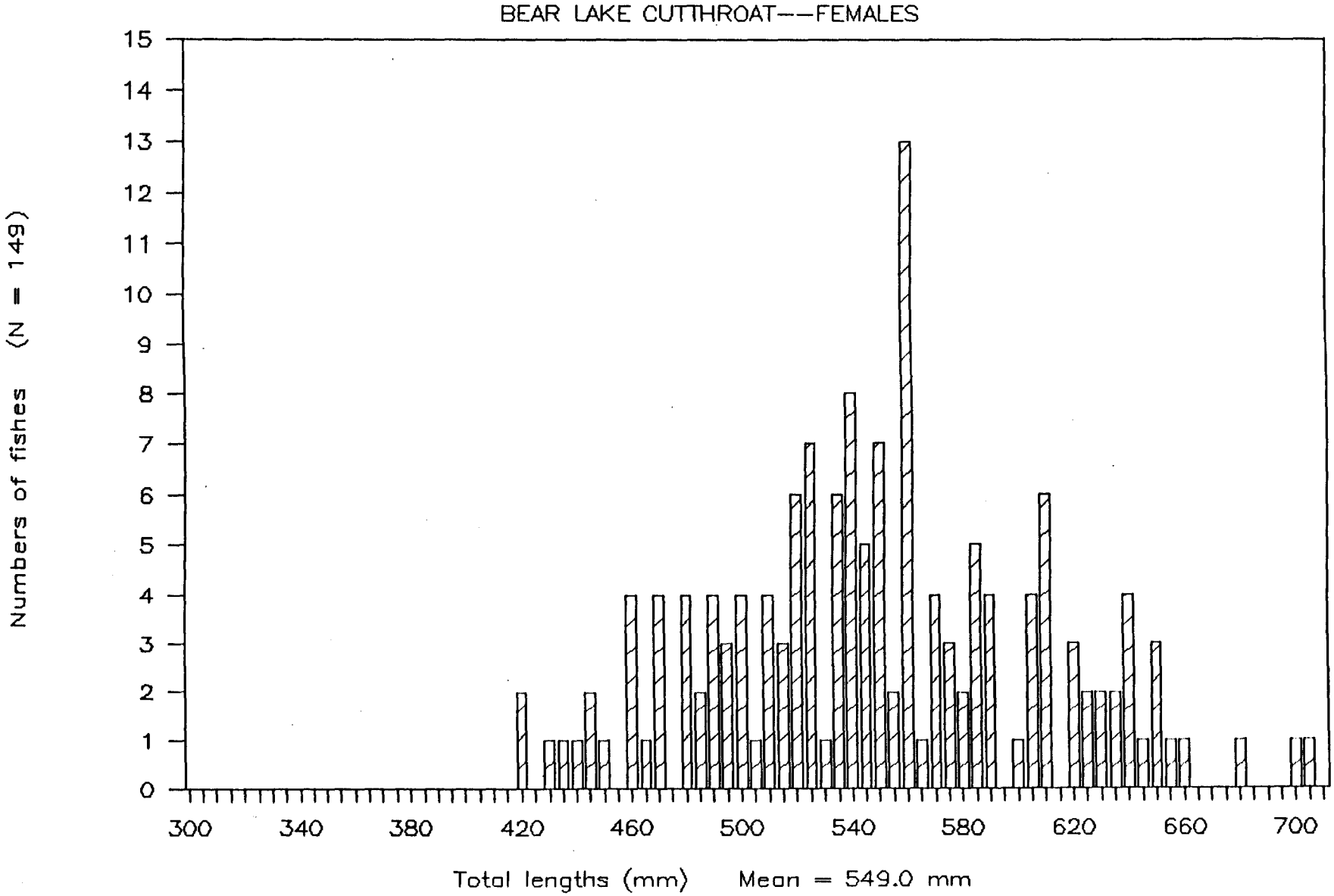


FIGURE 3. ST.CHARLES CREEK TRAP--1989



eggs (36.2%), with the remainder from fish captured at Swan Creek (656,395 eggs) and Big Spring (9094 eggs). Egg survival to eye-up at Mantua Hatchery was 75.8%. Grace Hatchery received 124,200 fry from Mantua on October 19, 1989.

Little Blackfoot River Trap and Spawntake

Bear Lake cutthroat trout have been introduced to Blackfoot Reservoir and return to the Little Blackfoot River to spawn. A trapping and spawning operation was performed by Grace Hatchery personnel to help maintain this run. A temporary trap was installed approximately 200 feet above the river mouth on April 17, 1989. Morpholine was dripped into the river above the trap to attract imprinted fish. The trap operated through June 12 (56 days) and captured 583 Bear Lake cutthroat (Table 7), including 261 males and 322 females (43.4% and 56.6%, respectively). The majority of both sexes were age-4 fish, with some age-3 and age-6 fish (Figures 4 and 5). Return of the age-5 year class was still low.

Spawntaking began on May 11, and proceeded daily from May 12 through June 11. Spawning was done early each morning when water temperatures were lowest (50 to 58°F). A number of females entered the trap ripe, and a few were overripe. Most overripe eggs were discarded. A total of 265 females were spawned to produce 489,416 green eggs (average 1,847 eggs/female) (Table 8). Survival to eye-up was 66.4%, or 324,785 eggs. Approximately 289,000 swim-up fry were produced.

A total of 158 adult cutthroat were sacrificed over the course of spawntaking for disease analysis. Kidney and spleen tissue samples and kidney smears were taken from each fish, and ovarian fluids were collected from each female. Two pooled ovarian samples were positive for Renibacterium salmoninarum (Table 2). Incubation and early rearing before the test results were complete had mixed the fry from these adults with others from earlier egg takes. All potentially infected or contaminated fry were destroyed (approximately 89,400).

Other Projects

Grace Hatchery personnel were involved in an attempt to raise channel catfish in spring water near Alexander Reservoir. The Soda Springs Sportsmen's Club was given 9,000 channel catfish fingerling on May 27 to rear in a screened earth channel. Hatchery personnel provided feed and advice to club members, who then did all the feeding and care for the fish. Cold temperatures, heavy predation by herons, thick growth of aquatic vegetation, and the use of herbicide (2-4-D) along the channel all contributed to a very poor return from the pond (estimated 1%).

Hatchery personnel traveled to the Salt Lake City Airport in the evening of August 8 to receive a shipment of grass carp from Malone, Arkansas. One hundred were then planted in Dike Lake (Region 5), and the remaining 50 were taken to Region 6 and planted in Robert's Pond.

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Table 7. Summary of Little Blackfoot River Trap operations, April 17 through June 12, 1989.

Week	No. of Bear Lake cutthroat	Male/ female	Water temp. range (F)	Other fish
4/17-23	0	0/0	41-58	2 rbt
4/24-30	0	0/0	34-59	2 rbt
5/1-7	9	6/3	37-63	14 rbt
5/8-14	40	26/14	39-73	16 rbt 2 ysct[a]
5/15-21	148	79/69	36-66	10 rbt
5/22-28	160	78/82	54-65	
5/29-6/4	156	58/98	55-64	2 ysct
6/5-11	70	14/56	55-66	1 rbt
6/12 (1 day)	0	0/0	56	
	583	261/322	x = 53.3[b]	45 rbt 4 ysct

[a]Mean temperature during trap operation. Mean during the spawning period (5/11 - 6/11) = 56.1°F.

[b]Yellowstone cutthroat trout.

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FIGURE 4. LITTLE BLACKFOOT TRAP--1989

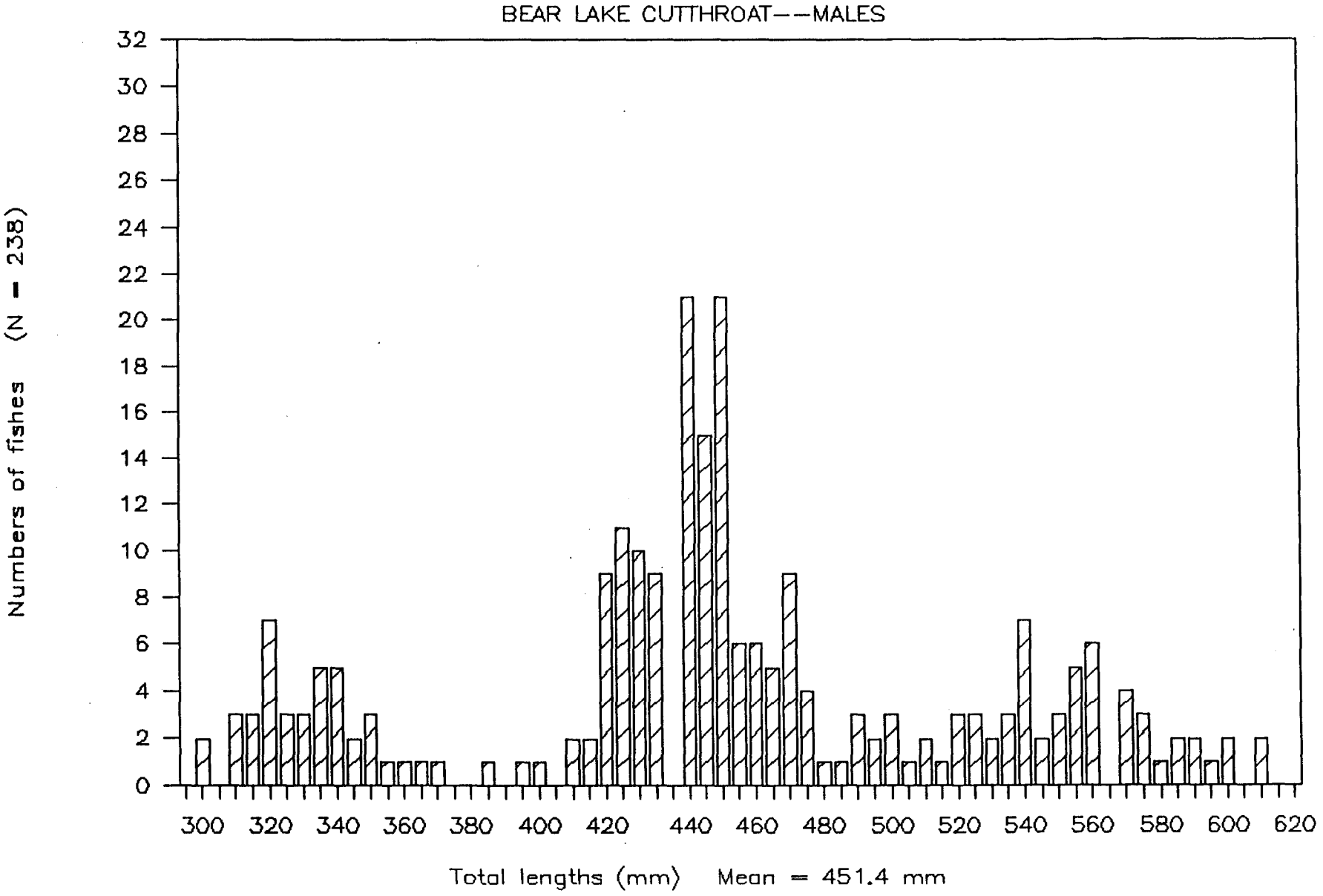

FIGURE 5. LITTLE BLACKFOOT TRAP--1989

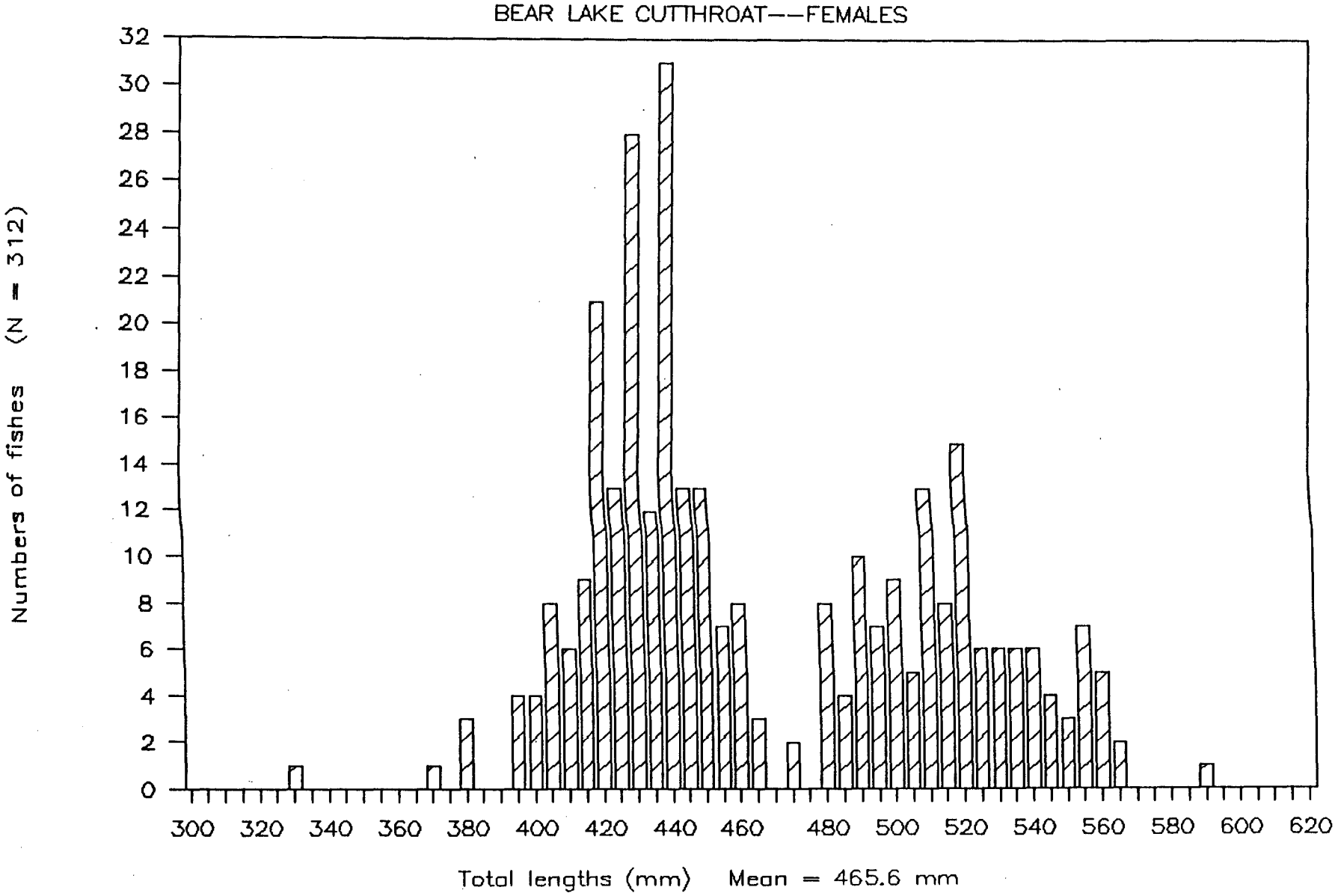

Table 8. Summary of Bear Lake cutthroat spawning at the Little Blackfoot River trap, May 11 through June 11, 1989.

Date	Water Temp (F)	Females spawned	No. green eggs	Eggs/ female	No. eyed eggs	Percent eye-up
5/11	55	3	7,116	2,372	914	12.8
5/14	53	2	3,120	1,560	2,881	92.3
5/15	55	4	4,995	1,249	4,652	93.1
5/16	56	3	5,422	1,807	2,711	50.0
5/17	54	5	5,475	1,095	4,380	80.0
5/18	57	5	10,440	2,088	7,490	71.7
5/19	53	7	12,006	1,715	11,126	92.7
5/20	50	5	9,625	1,925	5,859	60.9
5/21	54	5	9,666	1,933	6,086	63.0
5/22	54	15	29,822	1,988	18,590	62.3
5/23	58	8	18,568	2,321	7,596	40.9
5/24	54	6	11,600	1,933	10,388	89.6
5/25	55	18	31,078	1,727	22,758	73.2
5/26	54	9	17,577	1,953	14,481	82.4
5/27	58	5	9,125	1,825	7,288	79.9
5/28	58	12	22,656	1,888	17,434	77.0
5/29	57	11	18,240	1,658	7,059	38.7
5/30	57	14	23,046	1,646	15,364	66.7
5/31	56	6	12,078	2,013	11,858	98.2
6/01	57	12	24,293	2,024	16,478	67.8
6/02	56	12	22,580	1,882	17,745	78.6
6/03	57	19	35,712	1,880	32,640	91.4
6/04	57	16	32,000	2,000	23,600	73.8
6/05	57	9	15,645	1,738	12,293	78.6
6/06	57	10	18,586	1,859	10,592	57.0
6/07	57	9	16,303	1,811	9,478	58.1
6/08	58	15	25,723	1,715	14,912	58.0
6/09	58	13	24,029	1,848	2,353	9.8
6/11	55	7	12,890	1,841	5,777	44.8
TOTALS:		265	489,416		324,785	
AVERAGES:	55.8			1,847		66.4

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A maintenance feeding experiment was conducted from January through March on two raceways of rainbow trout (Shepard of the Hills strain). Raceway L2 was fed on Mondays, Wednesdays, and Fridays at a feed rate determined by Haskell's formula, using a conversion of 1.3 and daily growth of 0.02 inches. Raceway L3 was not fed for the first half of each month, then was fed 6 days per week at a rate from Haskell's at 1.2 conversion and 0.02 inches daily growth. Both raceways contained approximately the same numbers and pounds of fish. Twenty fish samples were taken from each raceway on January 9 and on April 7. Individual length, weight, fat index, and fin index were taken from each fish, and means compared between the raceways (Table 9). Results indicated that both diets were effective in maintaining fish at a given size for a three-month period, that both diets resulted in a decrease in both body fat and condition factor, and that neither diet had an obvious advantage over the other. Small sample size may have led to confusing information when comparing mean lengths, weights, and condition factors. Mortality over the period was slightly lower in Raceway L3, but not significantly.

Another experiment was conducted using baffle boards in a small raceway full of Bear Lake cutthroat. Four 1/2-inch plywood boards were cut to fit the raceway and set at the recommended height and spacing (Boersen and Westers, 1986. Progressive Fish-Culturist. Vol. 48, No. 2). These did move the solid wastes to the bottom of the raceway but caused other cleaning problems, such as trapping floating leaves and trash, and providing greater surface area for fungus and algae growth. The small raceways are reasonably easy to clean without modification, so the baffles were not an improvement. A baffle system might work better in the longer medium raceways, and may be tried in the future.

Table 9. Results of a maintenance diet experiment done with Shephard of the Hills strain rainbow trout at Grace Hatchery, January-March, 1989.

	Raceway L2 Diet A			Raceway L3 Diet B		
	Jan. 9	Apr. 7	Percent change	Jan. 9	Apr. 7	Percent change
Mean weight per fish (g)	107.20	116.85	+9.0	110.80	123.45	+11.4
Mean length per fish (mm)	213.95	227.70	+6.4	218.75	229.60	+5.0
Mean C-factor (x 0.0001)	3.746	3.398	-9.3	3.718	3.531	-5.0
Mean fat index	2.05	1.20	-41.4	2.75	1.00	-63.6
Mean fin index	0.60	0.70	+16.7	0.45	0.55	+22.2
Total mortality for the period	174 (0.31%)			135 (0.24%)		

DIET A: Fed Mondays, Wednesdays, and Fridays at a rate calculated from Haskell's formula using conversion = 1.3 and daily growth = 0.02 inch.

DIET B: No feed for first half of month, followed by standard feeding, 6-days/week, at rate from Haskell's formula using conversion = 1.2 and daily growth = 0.02 inch.

GRACT1